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(71)Applicant : NEC CORP

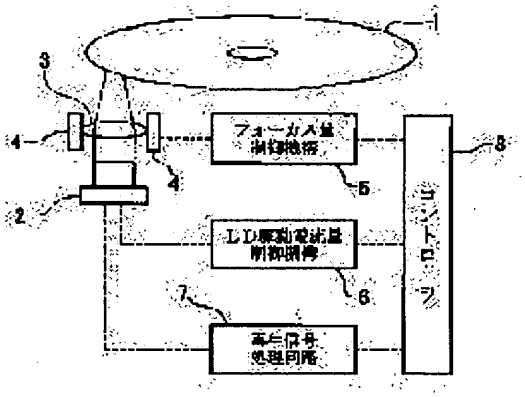
(72)Inventor : MASUDA TAKAYUKI

(54) OPTICAL DISK APPARATUS

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain an optical disc apparatus that can automatically set the optimum focus condition of a optical system and the power condition of laser on the occasion of recording and reproducing information.

SOLUTION: In this optical disk apparatus, information is recorded or reproduced to/from a recording medium 1 by irradiating the recording medium 1 with an optical beam emitted from a light emitting element 2 via an optical system 3. In this case, there are provided a focusing amount control means 5 for adjusting the optical system 3 to control the focusing of the emitted optical beam, a drive current control means 6 for controlling a drive current of a light emitting element 2 to control intensity of the emitted beam, a reproduced signal processing means 7 for converting the optical beam reflected from a recording medium 1 into an electrical signal as the reproduced signal, a judging means for judging the propriety of the reproduced signal and a control means 8 for individually controlling these means.



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CLAIMS

[Claim(s)]
[Claim 1] By making the light which carries out outgoing radiation irradiate a record medium through optical system from a light emitting device In the optical disk unit which performs informational record and playback of a up to [this record medium] The amount control means of focuses which adjusts said optical system in order to control the amount of focuses of said outgoing radiation light, The drive current control means which controls the drive current of said light emitting device in order to control the optical reinforcement of said outgoing radiation light, The optical disk unit characterized by having the regenerative-signal processing means which changes the reflected light from said record medium into an electrical signal, and is made into a regenerative signal, a judgment means to judge the quality of said regenerative signal, and the control means which controls each [these] means separately.
[Claim 2] By making the light which carries out outgoing radiation irradiate a record medium through optical system from a light emitting device In the optical disk unit which performs informational record and playback of a up to [this record medium] The amount control means of focuses which adjusts said optical system in order to control the amount of focuses of said outgoing radiation light, The drive current control means which controls the drive current of said light emitting device in order to control the optical reinforcement of said outgoing radiation light, The optical disk unit characterized by having a regenerative-signal judging means to ask for the wave amplitude and/or resolution of a regenerative signal from said record medium, and to judge the quality of said regenerative signal based on this wave amplitude and/or resolution, and the control means which controls each [these] means separately.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] In case this invention relates to an optical disk unit and records and reproduces information especially, it relates to the optical disk unit which can set up automatically the optimal optical-system focus conditions and the power conditions of laser.
[0002]
[Description of the Prior Art] Conventionally, the optical disk unit (optical disk drive) is used as stores for an escape, such as a personal computer. Large capacity and since it is high-density compared with the conventional floppy disk drive unit etc., this optical disk unit has the description which informational record, playback, and retrieval excelled [high speed / the possibility of record and playback of image information, and] in possible **.
[0003] In the conventional optical disk unit, although a laser beam is used in the case of record and playback, in order to change with various factors, such as record sensibility of a record medium, the property of the optical system which condenses the laser beam from a light emitting device (laser), and surrounding temperature, the activity which adjusts record power and the amount of focuses for every optical pickup equipment is indispensable to the record power and the amount of focuses of this laser beam. In the conventional optical disk unit, it was usually at the time of record power adjustment and record that the amount adjustment of focuses is performed in a respectively different process.
[0004]
[Problem(s) to be Solved by the Invention] By the way, in the conventional optical disk unit, since the production process was divided into plurality, plurality-ization of a human man day and a production facility etc. was needed, and there was a trouble that very many man days will be wasted. Moreover, at the process which adjusts record power, and the process which adjusts the amount of focuses, since it was necessary to use the medium for another adjustment, when property change arose to one medium, there was a possibility that effect might attain to even adjustment of another side, and there was a trouble that there was a case where it becomes impossible to maintain the compatibility between each processes.
[0005] In case this invention is made in view of the above-mentioned situation and records and reproduces information, it aims at offering the optical disk unit which can set up automatically the optimal optical-system focus conditions and the power conditions of laser.
[0006]
[Means for Solving the Problem] this invention person acquired the following knowledge, as a result of inquiring wholeheartedly. In order to set up automatically the optimal optical-system focus conditions and the power conditions of laser, in case the proper record conditions in an optical disk unit are searched, the record condition at the time of changing the amount of optical-system focuses and laser record power, and making it record distinguishes by the ability of data reading to be able to perform normally, record conditions can narrow down and, finally the optimal optical-system focus conditions for record and laser record power conditions can set as coincidence by repeating this.

[0007] By the above, the optical disk unit of the invention in this application according to claim 1 By making the light which carries out outgoing radiation irradiate a record medium through optical system from a light emitting device In the optical disk unit which performs informational record and playback of a up to [this record medium] The amount control means of focuses which adjusts said optical system in order to control the amount of focuses of said outgoing radiation light, The drive current control means which controls the drive current of said light emitting device in order to control the optical reinforcement of said outgoing radiation light, It is characterized by having the regenerative-signal processing means which changes the reflected light from said record medium into an electrical signal, and is made into a regenerative signal, a judgment means to judge the quality of said regenerative signal, and the control means which controls each [these] means separately.
[0008] An optical disk unit according to claim 2 is making the light which carries out outgoing radiation irradiate a record medium through optical system from a light emitting device. In the optical disk unit which performs informational record and playback of a up to [this record medium] The amount control means of focuses which adjusts said optical system in order to control the amount of focuses of said outgoing radiation light, The drive current control means which controls the drive current of said light emitting device in order to control the optical reinforcement of said outgoing radiation light, It asks for the wave amplitude and/or resolution of a regenerative signal from said record medium, and is characterized by having a regenerative-signal judging means to judge the quality of said regenerative signal based on this wave amplitude and/or resolution, and the control means which controls each [these] means separately.
[0009]
[Embodiment of the Invention] Each operation gestalt of the optical disk unit of this invention is explained based on a drawing.
[Operation gestalt of ** 1st] drawing 1 is the block diagram showing the optical disk unit of the 1st operation gestalt of this invention, and is set to drawing 1 . An optical disk (record medium) and 2 a sign 1 A laser diode (LD: light emitting device), The optical system which condenses the laser beam which carries out outgoing radiation of 3 from LD2, and 4 The actuator for justification of optical system 3, The amount controlling mechanism of focuses (the amount control means of focuses) and 6 5 The amount controlling mechanism of LD drive currents (drive current control means), While building in the judgment section (judgment means) 7 performs a regenerative-signal processing circuit (regenerative-signal processing means), and 8 judges the quality of a regenerative signal to be, it is the controller (control means) which controls the amount controlling mechanism 5 of focuses - the regenerative-signal processing circuit 7 separately.
[0010] In this optical disk unit, the amount controlling mechanism 5 of focuses and the amount controlling mechanism 6 of LD drive currents are controlled by Cong L'Ora 8, it records on an optical disk 1, and that recorded data result is grasped through the regenerative-signal processing circuit 7 by the controller 8. By changing the above-mentioned record conditions and repeating the above-mentioned actuation, the optimal optical-system focus conditions for record and laser record power conditions are set as coincidence.
[0011] From LD2, it was condensed by optical system 3 and postoperativus irradiation of the laser beam by which outgoing radiation was carried out is carried out to this optical disk 1. The magnitude of the laser beam irradiated by the optical disk 1 is adjusted by positioning optical system 3 with an actuator 4. The amount of adjustments at the time of positioning an actuator 4 is controlled by the amount controlling mechanism 5 of focuses. Moreover, the reinforcement of the laser beam irradiated by the optical disk 1, i.e., the reinforcement of the laser beam which carries out outgoing radiation from LD2, is controlled by the amount controlling mechanism 6 of LD drive currents.
[0012] Moreover, in case the data recorded on the optical disk 1 are read, the regenerative-signal processing circuit 7 is used. And the amount controlling mechanism 5 of these focuses, the amount controlling mechanism 6 of LD drive currents, and the regenerative-signal processing circuit 7 are controlled by the controller 8.
[0013] Next, an optical disk 1 is made to irradiate the laser beam of a certain reinforcement in the

outline of the sequence of this optical disk unit of operation in a certain amount of focuses, and that recorded data is explained based on a series of motions to reproduce. From a controller 8, directions are sent to the amount controlling mechanism 5 of focuses so that it may become the desired amount of focuses. The amount controlling mechanism 5 of focuses adjusts an actuator 4 that the directions from a controller 8 should be performed. Moreover, in parallel to this, directions are sent to the amount controlling mechanism 6 of LD drive currents so that it may become desired laser reinforcement from a controller 8.

[0014] The amount controlling mechanism 6 of LD drive currents adjusts the amount of currents which drives LD2 that the directions from a controller 8 should be performed. It is recordable on an optical disk 1 by the desired amount of focuses, and desired laser reinforcement with these.

[0015] Moreover, in case the data recorded on the optical disk 1 are reproduced, laser reinforcement required for playback is irradiated by the optical disk 1 through optical system 3 from LD2, and the quantity of light of the laser beam which is the reflected light is inputted into the regenerative-signal processing circuit 7 through optical system 3. In the regenerative-signal processing circuit 7, the quantity of light of a reflective laser beam is changed into 0/1 of digital data, and data are read by the controller 8. Distinction of the right and wrong of playback data is performed within a controller 8.

[0016] Next, the example of actuation of this optical disk unit is explained based on drawing 1 and drawing 2 . Usually, by equipment, the range of the amount of focuses which can be reproduced by recording normally in record to an optical disk 1 is peculiar, and the amount is limited to a certain within the limits. Moreover, the range becomes so narrow that the reinforcement (record power) of the quantity of light of the laser beam irradiated at the time of record is weak. Here, the general relation of the right and wrong of data logging in the amount of focuses as shown in drawing 2 , and record power, and the data quality at the time of data playback is assumed.

[0017] Here, while setting focal variation to a total of 11 steps, record power is set as five steps. These numbers of setting phases are arbitrary, and are prescribed by the adjustable range and adjustment time amount of the equipment. Moreover, record power serves as reinforcement with the weaker E from A all over five steps.

[0018] When record power is large, record of data and the quality at the time of playback are good for (A) in nine steps of **in 11 steps of amounts of focuses - (10). This is because it will be said that **- (10) is distributed near the optimal amount of focuses for the record and playback in this record power. On the contrary, it will be said that ** and (11) have shifted from the amount distribution of focuses of the above-mentioned optimum. By the above, the amount of focuses with the sufficient data quality in the record power A in which record playback is possible will be called the range of **- (10).

[0019] Next, one step of record power is lowered (B). Although the amount of focuses is changed like the above and record and playback of data are performed, in the time of the record power of one step [not 11 steps but] ago, the range of the focus to change is limited to the quality range (the above-mentioned example nine steps of **- (10)), and is performed. This is because the range of the amount of focuses with the sufficient data quality at the time of record playback becomes narrow, when record power generally falls. In other words, in the amount of focuses with poor data quality, by power lower than it, I hear that it does not become data quality fitness, and it is [the high power of one step ago]. Consequently, by the record power B, the range which becomes good [data quality] turns into range which is seven steps of ** - **.

[0020] if similarly one step of record power is lowered and the amount of focuses with good (C) data quality is searched -- ** - ** -- if one step of record power is lowered further and the five steps of the amounts of focuses with good (D) data quality are searched -- the three-stage of ** - ** -- if one step of record power is lowered further and the amount of focuses with good (E) data quality is searched, it will become one step of **. It means that the amount of focuses (**) in which the record playback with sufficient data quality is possible was detected by the thereby lowest record power (E). It will be called the optimal amount of focuses for record playback, the best amount of focuses of focuses, i.e., this amount, (**) of record regeneration efficiency.

[0021] In addition, in this example, although only the amount of 1 focuses finally remained, when the

data quality of the amount of two or more focuses is good and then it lowers one-step record power, when data quality is poor, it is assumed altogether that the core of two or more range which was good as for data quality serves as the amount of optimal focuses by the record power of one step ago. Moreover, it means that the record playback minimum power with sufficient data quality had also been detected by coincidence. The record power actually used within equipment should just perform a power setup which added the margin from this minimum power (E).

[0022] Since it considered as the configuration which was explained above and which was equipped with the amount controlling mechanism 5 of focuses, the amount controlling mechanism 6 of LD drive currents, the regenerative-signal processing circuit 7, and the controller 8 like according to the optical disk unit of this operation gestalt Coincidence can be asked for the record low power which is an important element and in which an account rec/play student is possible, and the amount of focuses with the most sufficient record regeneration efficiency, when record power and the amount of focuses can be changed to coincidence at the time of retrieval, consequently record power is set up.

[0023] moreover, under processing -- the amount variability region of focuses -- the record power of one step ago -- setting -- data quality -- good -- record -- since it limits to the refreshable focal range, it can ask for the both sides of the best amount of focuses of record low power and record regeneration efficiency in a short time. Moreover, since a predetermined item can be adjusted in a short time as mentioned above, compaction of the time amount which the adjustment in the process which sets up the record power and the amount of focuses of an optical disk unit of a production line takes can be aimed at.

[0024] [Operation gestalt of ** 2nd] drawing 3 is the block diagram showing the optical disk unit of the 2nd operation gestalt of this invention, and the point that the optical disk unit of this operation gestalt differs from the optical disk unit of the 1st operation gestalt mentioned above is a point of having used the regenerative-signal amplitude judging circuit (regenerative-signal judging means) 9 instead of the regenerative-signal processing circuit 7.

[0025] This regenerative-signal amplitude judging circuit 9 has composition which a current playback wave amplitude understands. With this configuration, instead of judging the right and wrong at the time of playback in data quality like the optical disk unit of the 1st operation gestalt mentioned above, it can ask for the wave amplitude and/or resolution of a regenerative signal from a certain optical disk 1, and the quality of a regenerative signal can be judged based on this wave amplitude and/or resolution.

[0026] When judging with a certain predetermined amplitude, record power is changed and it asks for the amount of optimal focuses, and the optimal record power like the optical disk unit of the 1st operation gestalt by making into a point with good data quality the range of the amount of focuses where a certain amplitude value more than fixed was obtained after changing the amount of focuses and recording it. It is required of this operation gestalt beyond a predetermined value with the equipment top regenerative-signal amplitude, and it is effective when the optimal record conditions at that time need to be searched.

[0027] moreover, a certain predetermined resolution when judging with a certain predetermined resolution, after changing record power, and changing the amount of focuses and recording -- it asks for the amount of optimal focuses, and the optimal record power like the optical disk unit of the 1st operation gestalt by making into a point with good data quality the range of the amount of focuses where the value was acquired. this operation gestalt -- an equipment top regenerative signal -- it is required in the range of a predetermined value with resolution, and retrieval of the optimal record conditions at that time is the need -- by the way, it is effective.

[0028] Moreover, as shown in drawing 4 , in addition to the judgment of the right and wrong of the optical disk unit of the 1st operation gestalt shown in drawing 2 , the value of standard is set to the amount of focuses and record low power which were finally able to be found. It is the range judged that this value of standard must not be beforehand set up on equipment other than this range at the time of a design. With this configuration, when it comes for this adjustment, with the fault at the time of manufacture included, the amount of focuses calculated by this adjustment approach, or record power and this value of standard are compared.

[0029] Also in the optical disk unit of this operation gestalt, the same effectiveness as the optical disk unit of the 1st operation gestalt can be done so. And since optical system is deforming, it can prevent that the amount of focuses which should not be essentially calculated on equipment will be calculated. Moreover, since the lens currently used for optical system is dirty, it can prevent that the record power beyond the need will be called for. Furthermore, it can judge whether this optical disk unit is made as the design value.

[0030] As mentioned above, although each operation gestalt of the optical disk unit of this invention has been explained based on a drawing, modification of a design etc. is possible for a concrete configuration in the range which is not limited to this operation gestalt and does not deviate from the summary of this invention.

[0031]

[Effect of the Invention] Like, according to the optical disk unit of this invention according to claim 1, when [which was explained above] record power and the amount of focuses can be changed to coincidence at the time of retrieval, consequently record power is set up, coincidence can be asked for the record low power which is an important element and in which an account rec/play student is possible, and the amount of focuses with the most sufficient record regeneration efficiency. Moreover, it can ask for the both sides of the best amount of focuses of record low power and record regeneration efficiency in a short time, and compaction of the time amount which the adjustment in the process which sets up the record power and the amount of focuses of an optical disk unit of a production line takes can be aimed at.

[0032] According to the optical disk unit according to claim 2, in addition to the effectiveness of an optical disk unit according to claim 1, the following effectiveness can be done so. Since optical system is deforming, it can prevent that the amount of focuses which should not be essentially calculated on equipment will be calculated. Moreover, since the lens currently used for optical system is dirty, it can prevent that the record power beyond the need will be called for. Furthermore, it can judge whether this optical disk unit is made as the design value.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the optical disk unit of the 1st operation gestalt of this invention.
[Drawing 2] It is the explanatory view showing the example of the optical disk unit of the 1st operation gestalt of this invention of operation.
[Drawing 3] It is the block diagram showing the optical disk unit of the 2nd operation gestalt of this invention.
[Drawing 4] It is the explanatory view showing the example of the optical disk unit of the 2nd operation gestalt of this invention of operation.
[Description of Notations]
1 Optical Disk
2 Laser Diode
3 Optical System
4 Actuator
5 The Amount Controlling Mechanism of Focuses
6 The Amount Controlling Mechanism of LD Drive Currents
7 Regenerative-Signal Processing Circuit
8 Controller
9 Regenerative-Signal Amplitude Judging Circuit

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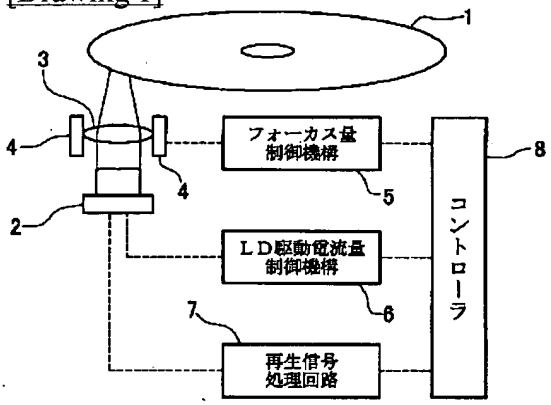
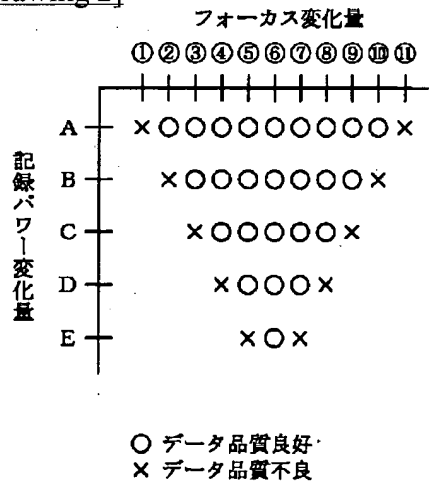
DRAWINGS

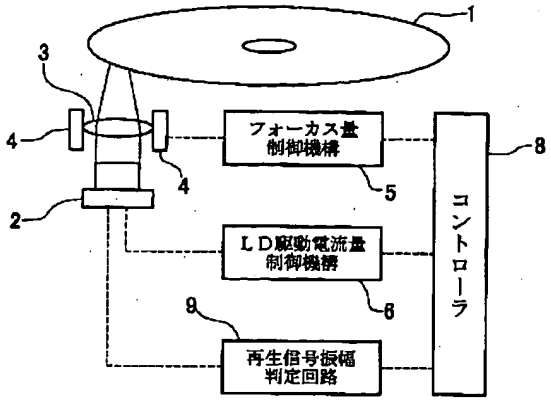
[Drawing 1]



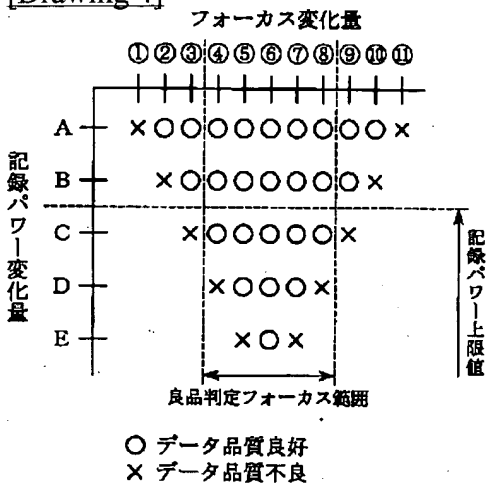
[Drawing 2]



[Drawing 3]



[Drawing 4]



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